APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/511,077	04/26/2005	Roberto Mariani	2085-02800	6490

23505   7590   04/23/2009
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EXAMINER
LE, BRIAN Q

ART UNIT	PAPER NUMBER
2624	

NOTIFICATION DATE	DELIVERY MODE
04/23/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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	Application No.	Applicant(s)	
Office Action Summary	10/511,077	MARIANI, ROBERTO	
	Examiner	Art Unit	
	BRIAN Q. LE	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>13 February 2009</u>.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1 and 3-37</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1, 3-37</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____.

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

Response to Amendment and Arguments

1.   Applicant's amendment filed February 13, 2009, has been entered and made of record.

2.   The rejection of claims 1-37 under 35 U.S.C. 112 is now withdrawn.

3.   Applicant's arguments with regard to claims 1, 20 and 37 have been fully considered, but are not considered persuasive because of the following reasons:

        Regarding claim 1, the Applicant argues (page 10 of the Remarks) that the combination Yan and Tian do not teach the probability of errors during the initial capture into consideration for the purpose of improving the robustness of the recognition system. First, the Examiner would like to point out that this argument was not claimed as argued. Secondly, Yan teaches a concept of finding probability of errors (minimization problem) (column 9, lines 25-35).

        For all other arguments, please refer back to the discussion above since they are depending on the basis of the argument discussed above.

        The Examiner believes that all the arguments of the Applicant have been properly addressed and explained. Thus, the rejections of all of the claims are maintained.

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1, 3-11, 14, 15, 17, 20-27, 30, 31, 33, 36, and 37 are rejected under 35 U.S.C.

103(a) as being unpatentable over U.S. Patent 6,975,750 by Yan et al. ("Yan") in view of U.S.

Patent 6,879,709 by Tian et al. ("Tian").

Regarding claim 1, Yan discloses a face recognition and/or verification method

comprising the step of

registering a persons actual face wherein an image of said actual face is captured and

synthesized to create a plurality of face prototypes (212, figure 2), said face prototypes

representing possible appearances of said actual face under lighting conditions (column 8, lines

36-40), varying facial orientations (column 7, lines 5-8), and/or modeling errors (minimization

problem) (column 9, lines 25-35),

wherein said face prototypes are stored for later analysis and comparison with a captured

image to be recognised or verified (214, figure 2).

Yan teaches that the captured actual images are preferably "frontal" images of a person's

face (column 1/54-60) but does not appear to disclose that the captured faces are normalized via

at least one of translational, rotational and scalar transformations, as claimed.

Tian discloses a face processing system that deals with various facial expression (FIG. 3B

and FIG. 11, element 1170). In particular, Tian teaches that it is conventional to "normalize"

faces as a preprocessing step in a facial recognition system (column 1/63—2/24). That is, images

of different faces typically exhibit a great deal of variance in position, scale, and lighting, and it

may be necessary to normalize the faces to compensate for such variations of position, pose,

scale, and illumination.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time of

the invention to modify Yan by Tian to achieve the claimed invention by normalizing the

captured facial images, as claimed, since Yan teaches a preference for frontal images, and Tian

recognizes that in many circumstances it is necessary to normalize inputted facial images in

order to transform the faces into a desired position, pose, or scale—i.e., produce a standardized

frontal view according to Yan's preference.

Regarding claim 3, Yan discloses comparison of said face prototypes and captured image

uses a face matching algorithm (column 12/12-33).

Regarding claim 4, Yan discloses comparison of said face prototypes and captured image

uses face templates or feature vectors (column 12/12-33: feature vectors used as input to neural

network facial recognizer—see figure 4 of U.S. Pat. 6,944,319, which Yan incorporates by

reference).

Regarding claim 5, the combination of Yan and Tian teaches synthesizing of said actual

face includes normalising said actual face image based on the spatial relationship between at

least two features of the actual face image (see Tian, column 2/8-24: pose is adjusted based on

relationship among eyes, nose, and mouth).

Regarding claim 6, the combination of Yan and Tian teaches normalising includes

rotating said actual face image to bring eyes of said actual face image to a horizontal plane

(column 12/12-33: face is rotated to a frontal view, thereby bringing eyes to a horizontal plane).

Regarding claim 7, the combination of Yan and Tian teaches normalising includes

scaling said actual face image such that the eyes are a fixed distance apart (column 1/63—2/19:

the segment between the eyes is identified and the face is scaled to a desired scale, thereby bringing the face to a standardized frontal view with the eyes a fixed distance apart).

Regarding claim 8, the combination of Yan and Tian teaches normalizing the facial image to a desired scale but does not expressly disclose that the eyes are fixed at 50 pixels apart. However, such a limitation is not considered to patentably distinguish from the combination of Yan and Tian since it appears to represent merely an arbitrary facet of the invention. Those skilled in the art would have been aware of the relative pros and cons of utilizing any specific size of facial images to process and would have taken those factors into consideration as design choices dependant upon the particulars of the operating environment.

Regarding claim 9, Yan discloses the area above the person's eyebrows and below the person's mouth is not synthesized (see e.g., figure 6: the area above the eyes (the hair) and the area below the mouth (the neck) are not synthesized).

Regarding claim 10, Yan discloses synthesizing of said actual face includes determining alternative positions for each eye so as to compensate for possible errors (see figure 9: synthesizing includes determining alternative poses of the face having different eye positions to compensate for potential matching errors when recognizing a face captured at an arbitrary pose).

Regarding claim 11, Yan discloses five alternative positions are determined for each eye (see figure 9: more than 5 positions are determined).

Regarding claim 14, Yan discloses synthesizing of said actual face includes applying at least one predefined warping mark to said actual face image (see e.g., figure 6—textured mesh used for warping is applied to the face).

Regarding claim 15, Yan discloses 25 predefined warping marks are used (see figure 6: more than 25 mesh triangles are used).

Regarding claim 17, Yan discloses said at least one warping mask includes geometric transform (column 9/1-36: the vertices of the mesh triangles are geometrically transformed to warp the face).

Regarding claim 20, Yan discloses a facial prototype synthesis system wherein an image of a persons actual face is used for creating a plurality of face prototypes, said face prototypes representing possible appearances of said actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors, and wherein said face prototypes are stored for later use (see e.g., figures 1 and 2).

Yan teaches that the captured actual images are preferably "frontal" images of a person's face (column 1/54-60) but does not appear to disclose that the captured faces are normalized via at least one of translational, rotational and scalar transformations, as claimed.

Tian discloses a face processing system. In particular, Tian teaches that it is conventional to "normalize" faces as a preprocessing step in a facial recognition system (column 1/63—2/24). That is, images of different faces typically exhibit a great deal of variance in position, scale, and lighting, and it may be necessary to normalize the faces to compensate for such variations of position, pose, scale, and illumination.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Yan by Tian to achieve the claimed invention by normalizing the captured facial images, as claimed, since Yan teaches a preference for frontal images, and Tian recognizes that in many circumstances it is necessary to normalize inputted facial images in

order to transform the faces into a desired position, pose, or scale—i.e., produce a standardized

frontal view according to Yan's preference.

Regarding claim 21, the combination of Yan and Tian teaches that said actual face image

is normalized prior to creating said face prototypes based on the spatial relationship between at

least two features of the actual face image (see Tian, column 2/8-24: pose is adjusted based on

relationship among eyes, nose, and mouth).

Regarding claim 22, Yan discloses normalising includes rotating said actual face image

to bring eyes of said actual face image to a horizontal plane (column 12/12-33: face is rotated to

a frontal view, thereby bringing eyes to a horizontal plane).

Regarding claim 23, Yan discloses normalising includes scaling said actual face image

such that the eyes are a fixed distance apart (column 1/63—2/19: the segment between the eyes

is identified and the face is scaled to a desired scale, thereby bringing the face to a standardized

frontal view with the eyes a fixed distance apart).

Regarding claim 24, the combination of Yan and Tian teaches normalizing the facial

image to a desired scale but does not expressly disclose that the eyes are fixed at 50 pixels apart.

However, such a limitation is not considered to patentably distinguish from the combination of

Yan and Tian since it appears to represent merely an arbitrary facet of the invention. Those

skilled in the art would have been aware of the relative pros and cons of utilizing any specific

size of facial images to process and would have taken those factors into consideration as design

choices dependant upon the particulars of the operating environment.   .

Regarding claim 25, Yan discloses the area above the persons eyebrows and below the persons mouth is not synthesized (see e.g., figure 6: the area above the eyes (the hair) and the area below the mouth (the neck) are not synthesized).

Regarding claim 26, Yan discloses to create said face prototypes said system determines alternative positions for each eye so as to compensate for possible errors (see figure 9: synthesizing includes determining alternative poses of the face having different eye positions to compensate for potential matching errors when recognizing a face captured at an arbitrary pose).

Regarding claim 27, Yan discloses five alternative positions are determined for each eye (see figure 9: more than 5 positions are determined).

Regarding claim 30, Yan discloses to create said face prototypes said system applies at least one predefined warping mask to said actual face image (see e.g., figure 6—textured mesh used for warping is applied to the face).

Regarding claim 31, Yan discloses 25 predefined warping masks are used (see figure 6: more than 25 mesh triangles are used).

Regarding claim 33, Yan discloses said at least one warping mask includes geometric transform (column 9/1-36: the vertices of the mesh triangles are geometrically transformed to warp the face).

Regarding claim 36, Yan discloses said face prototypes are generated by applying photometric and/or geometric transforms to said image (column 9/1-36: the vertices of the mesh triangles are geometrically transformed to warp the face; column 12/7-11: photometric transform is applied).

Regarding claim 37, Yan discloses a facial prototype synthesis system wherein an image
of a persons actual face is synthesized by determining possible alternative eye positions and
applying at least one mask to said image to create a plurality of face prototypes, and wherein said
face prototypes represent possible appearances of said actual face under various lighting
conditions, varying facial expressions, varying facial orientations, and/or modeling errors (see
e.g., figures 1 and 2).

Yan teaches that the captured actual images are preferably "frontal" images of a person's
face (column 1/54-60) but does not appear to disclose that the captured faces are normalized via
at least one of translational, rotational and scalar transformations, as claimed.

Tian discloses a face processing system. In particular, Tian teaches that it is conventional
to "normalize" faces as a preprocessing step in a facial recognition system (column 1/63—2/24).
That is, images of different faces typically exhibit a great deal of variance in position, scale, and
lighting, and it may be necessary to normalize the faces to compensate for such variations of
position, pose, scale, and illumination.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time of
the invention to modify Yan by Tian to achieve the claimed invention by normalizing the
captured facial images, as claimed, since Yan teaches a preference for frontal images, and Tian
recognizes that in many circumstances it is necessary to normalize inputted facial images in
order to transform the faces into a desired position, pose, or scale—i.e., produce a standardized
frontal view according to Yan's preference.

3.   Claims 12, 13, 19, 28, 29, 32, and 35 are rejected under 35 U.S.C. 103(a) as being

unpatentable over U.S. Patent 6,975,750 by Yan et al. ("Yan") in view of U.S. Patent 6,879,709

by Tian et al. ("Tian") as applied to claims 1 and 20 above, and further in view of U.S. Patent

7,221,809 by Geng ("Geng").

        Regarding claims 12 and 28, Yan teaches that synthesizing of said actual face includes

adjusting the illumination thereof (column 12/7-11). However, Yan does not appear to expressly

disclose vary the illumination by applying at least one predefined lighting mask to said actual

face image.

        Geng discloses a facial recognition similar to that of Yan wherein multiple synthesized

faces are produced from one or two originally captured facial images. In particular, Geng, like

Yan, teaches that the illumination of the synthesized faces can be varied in order to account for

potential variations in lighting for recognition purposes. Figure 6 illustrates the concept of

generating multiple face images under various lighting conditions using predefined lighting

masks m_i (column 6/26-35).

        It would have been obvious to one of ordinary skill in the art at the time of the invention

to modify Yan and Tian by Geng to achieve the claimed invention by applying lighting mask(s)

to the actual face image as projected onto a 3-D face model since Yan teaches synthetically

varying the illumination of the face image to generate synthesizes facial images having different

illuminations, and Geng shows that a conventional way of achieving such a result is via the use

of lighting masks to vary the pixel colors (column 6/5-35).

Regarding claims 13 and 29, Geng does not appear to expressly disclose that three to 16 predefined lighting masks are used. However, such a limitation is not considered to patentably distinguish from the combination of Yan, Tian, and Geng since it appears to represent merely an arbitrary facet of the invention. Those skilled in the art would have been aware of the relative pros and cons of utilizing any specific number of different lighting masks in order to generate a desired number of different faces under differing illuminations and would have taken those factors into consideration as design choices dependant upon the particulars of the operating environment.

Regarding claims 16 and 32, Geng discloses said at least one lighting mask includes photometric transform (column 6/26-34: the pixel values are changed by mask m_i).

Regarding claims 19 and 35, Geng discloses said photometric transform includes at least one of: algorithmic function, exponential stretch, vertical shadow, horizontal shadow and differentiating image (column 6/26-34: algorithmic function m_i).

4.   Claims 18 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,975,750 by Yan et al. ("Yan") in view of U.S. Patent 6,879,709 by Tian et al. ("Tian") as applied to claims 17 and 33 above, and further in view of "The Integration of Optical Flow and deformable Models with Applications to Human Face Shape and Motion Estimation" by DeCarlo et al. ("DeCarlo").

Regarding claims 18 and 34, Geng does not appear to disclose that said geometric transform is estimated using optical flow estimation. However, DeCarlo shows that utilizing optical flow estimation to deform a textured face image into various poses and orientations was

conventional at the time the invention was made and would have been an obvious expedient to

those skilled in the art.

Conclusion

1.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

       A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the

advisory action. In no event, however, will the statutory period for reply expire later than

SIX MONTHS from the date of this final action.

Contact Information

1.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to BRIAN Q. LE whose telephone number is (571)272-7424. The

examiner can normally be reached on 8:30 A.M - 5:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Samir Ahmed can be reached on 571-272-7413. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Brian Q Le/
Primary Examiner, Art Unit 2624
Monday, April 20, 2009